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ABSTRACT

A study examined multiple outcomes of relaxation training simultaneously in seventh grade classrooms. "Project Relaxation" measured cognitive (achievement) and affective (discipline, attendance, tardiness, and self-concept) changes with a program of relaxation training for 532 seventh grade students in 10 private and public middle schools in South Carolina. The students in the experimental group participated for 15 minutes in relaxation training exercises at the beginning of each school day for 9 months. Teachers played a series of audio-taped relaxation exercises, developed especially for middle school students, including such techniques as the quieting reflex, autogenics, and visual imagery. Subjects recorded their temperatures using a wrist temperature indicator and biofeedback instrument. Researchers collected data on discipline, absences, and tardiness of students. At the end of the study, subjects completed the Comprehensive Tests of Basic Skills (for achievement measurement) and the Self Observation Scales (for self-concept measurement). The study found improvement in students' self-concepts, discipline, and achievement. Detailed discussion of study results for wrist temperatures, discipline, absence, and tardiness data, as well as testing results, is presented. The report contains 14 tables, 9 figures, extensive references, and availability for select relaxation exercises and biofeedback instruments. (JMK)

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RELAXATION TRAINING: ITS USEFULNESS IN THE
MIDDLE SCHOOL CURRICULUM

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RELAXATION TRAINING: ITS USEFULNESS IN THE MIDDLE SCHOOL CURRICULUM

Introduction

Relaxation training is one of the primary methods for dealing with excessive stress. One bases the training on the premise that an individual can be taught willfully to elicit the relaxation response, the exact opposite of the usual bodily response when fear and anxiety arise. Each person seems to have one's own physiological way of reacting to stress, whether by tensing the back and neck muscles, breathing rapidly, increasing the heart rate, or manifesting other physiological and biochemical responses. The body's attempt to counteract excessive stress can produce tension and interfere with coping in the context of intellectual and social settings.

In considering relaxation training, it is important to understand that nature has provided humans with homeostatic mechanisms, such as those mechanisms that regulate fluid and electrolytic balance, blood pressure, heart rate, and wound healing, in addition to those mechanisms to readjust more complicated functional disorders that are of a learning and emotional nature. The concept assumes that when a person is exposed to excessively disturbing stimulation such as emotional or physical trauma, the brain has the potential to utilize natural biological processes to reduce the disturbing consequences of the stimulation. The techniques that elicit the relaxation response are designed to support and facilitate the natural self-healing mechanisms that already exist in the body. Thus, the emphasis in a relaxation program is to train an individual to assist the body's natural systems in their inherent potentials of self-regulatory adjustment.

The relaxation state is induced by a variety of techniques, some of which are appropriate for the classroom. The techniques include progressive relaxation, autogenics, breathing exercises, visual imagery, meditation, quieting reflex,

certain approaches to hypnosis, various biofeedback techniques, and some elements of behavior therapy. For school purposes, the teacher may combine a variety of techniques, as is evident in the more recently developed exercises. Good illustrations are the programs developed by Lupin (1977), Peace, Harmony, Awareness: A Relaxation Program for Children, and Matthews (1982a), Relaxation Exercises for Young People. Each program starts with exercises based on progressive relaxation in order to teach the child the meaning of tense and relaxed muscles and then moves gradually to breathing exercises, autosuggestions, and guided imagery.

In order for the relaxation program to be effective in teaching the coping skill, the child requires regular practice over a period of time at school. Intellectual understanding of stress reduction techniques is of little value without firsthand experience and enough practice to make the technique automatic. Because of the need for practice like the other skills in school, authorities (Lupin, Braud, Braud, and Duer, 1976; Rossman and Kahnweiler, 1977; McBrien, 1978; Dinkmeyer and Dinkmeyer, 1979; Holland, 1980; Truch, 1980; Proeger, 1980; Onizo and Williams, 1981; and Matthews 1982b) recommend that relaxation training become part of the school curriculum for exceptional and regular programs, perhaps eventually becoming the Fourth "R" in the curriculum. Authorities agree that it is far more practical in the long run to train children to handle stress more effectively than it is to continue to try to alter the external environment each time the situation becomes a problem.

The Need for a Stress Management Program

Young people today are faced with a greater variety of perceived pressures and anxiety-producing problems than previous generations. Peer pressure, school pressure, changes in the traditional nuclear family, even the changing economic structure and the overwhelming technology of our society, combine to induce stress

situations in young people.

Society has changed at an alarming rate in the past twenty years, bringing a myriad of novel problems requiring adjustment. The traditional nuclear family is no longer the norm as the percentage of working mothers rises in either dual income families or in single parent families. No longer is there a parent or supervisor at home when the child leaves school for the day. Often children must adjust to a divorce, possibly a second or third marriage, as the divorce rate approaches 50 percent. This mobility of parental partners is an extreme form of the general mobility of the society. Change in the style of life becomes the only dependable constant, and a child's ability or lack of ability to adjust may affect performance in other areas.

The schools themselves have changed in ways which, while positive, put additional requirements on students. Children in school today must adjust to different ethnic groups whom they may never have encountered before. Also, the recent trend toward minimum competency testing may make students feel they must constantly prove themselves, especially if students are already under pressure from home.

The results of these problems emerge in the children themselves. A general sense of hostility is apparent in the high number of behavioral problems. Depressed boys and girls take prescription drugs, while a large percentage of other children take illegal drugs. According to Spencer (1979), on the sharp statistical rise are: teenage and child pregnancy; teenage and child alcoholism; teenage and child prostitution and pornography; teenage and child venereal disease; truancy; illiteracy; and criminality. But the most terrible and surprising aspect is suicide, the third leading cause of death among American children, preceded by accidents and murder. While the number of children who end their own lives is not astoundingly high, the rate of childhood suicide is increasing radically. In the past decade it has risen more than 100 percent. And the rate of attempted suicides is rising even faster.

Keelan (1978) and Davis, Eshelman, and McKay (1980) list a number of other manifestations of coping behavior in young people. The list includes: running away from home; fighting; assaulting teachers; vandalism; and extreme anxiety about tests and other school work. These behaviors are symptomatic and may establish life-long patterns of negative response to stressful situations.

All of these behaviors are negative outcomes of stress. In order to avoid these behaviors, children must learn to manage stress in a positive and constructive manner. Stress management training, such as relaxation training, is a skill which can help individuals throughout their lives.

Why Teach Relaxation Training?

The primary reason for teaching the skill of "willful relaxation" is for stress management. It is important to show the child that one can voluntarily regulate the psychological and physiological states of one's body. And the child can do it with only minimal reliance on drugs, conditioning, and the intervention of others -- in other words, with a minimum of external controls. Voluntary self-regulation is of primary importance in shaping and revitalizing children's self-image so that they can become more aware of themselves and also more aware of their relationships with others.

Being in control of the body is important to physical and mental health, indeed, the total mental and physiological outlook. K.B. Rotter (1966) spoke of the internal versus external expectancies as the locus of control. The locus of control represents the degree to which a person feels that what happens to one depends on one's behavior -- a feeling of internal control -- as opposed to feeling it is dependent on chance, fate, or is under the control of powerful others -- external control. However, internal locus of control is not something which is inborn; it must be learned by the individual. The well-known biofeedback authority, Barbara Brown (1977), voices the opinion that relaxation training

has the tendency to turn the child's attention inward. Thinking about internal controls reduces the amount of attention paid to external factors and leads to a decrease in mental tension concerning social pressures. This conditioning, in turn, alters the significance that the individual attaches to external environmental situations and stimuli.

For some time the medical profession has capitalized on the body's natural healing power. Holistic medicine encourages the child to relax and manage his or her health. The approach believes that a person can not only be well but also reach higher levels of energy, enthusiasm, and well-being than would be possible without the coping skill.

Just as the medical profession experiences secondary benefits from a program of relaxation training, the educational profession does also. Positive effects are evident in a variety of affective and cognitive behavior changes. Research shows that relaxation training assists children with developing self-management skills, building a positive self-image, and increasing certain aspects of achievement. These areas now will proceed in greater analytic detail.

Self Management Skills

The limited amount of research dealing with relaxation training shows its usefulness in the educational setting for changing affective behaviors. The majority of the literature deals with learning disabled or emotional disturbed children. One can surmise, however, that a treatment that is helpful for the exceptional child may be beneficial for the child in the regular classroom.

Also, no classroom is immune to the behavior problems of both regular and special education students. It is estimated that approximately 10 percent of all students in public schools have emotional problems severe enough to interfere with normal learning and social adjustment: for example, anxiety, phobic reaction, hyperactivity, fatigue, lack of attending skills, poor retention of

of content, poor self-image, and poor self-control. Just as one example of the severity of the problem, Miller (1970) did a study to determine the prevalence of hyperactivity in elementary schools and found that 1 in every 20 pupils and 1 in every 11 boys are affected by the syndrome. Recent research at Berkeley, the University of Oregon, and other educational centers suggests the problem is getting worse and that as many as 48 percent of all boys in American schools are either hyperactive, or have behavior problems that simulate hyperactivity (Walton, 1979).

Relaxation procedures help children develop more self-control. According to Lupin (1977) hyperactive children who learn relaxation procedures are less likely to cry, whine, or have temper tantrums. They are less irritable, less impulsive, and less distractible. One effect of relaxation training is that it allows children to develop a "stopping technique." As children learn more self-control, they will be able to take a deep breath and relax instead of plunging headlong without thought into a difficult situation. This procedure allows children to experiment with new behaviors and decide on a more desirable course of action.

The following studies show some of the research findings of children in the regular classroom and in exceptional programs. Relaxation training includes the various methods appropriate to children, that is, various forms of biofeedback, relaxation exercises on tape, and combinations of the two methods.

Braud and Braud (1974) indicated that using relaxation exercises on tape with 22 referred children (15 hyperactive, 6 behavior problems, and 1 autistic) significantly reduced tension levels. Additionally, Lupin, Braud, Braud, and Duer (1976) in an unpublished study reported that the use of relaxation exercises with hyperactive children and their parents significantly altered some of the children's rated behaviors. Watson and Hall (1977) in an unpublished document discussed the evaluation of 86 children (grades 4 through 6) in regular

and special education classes which were divided into groups receiving no treatment, placebo treatment, sensorimotor training, and relaxation training, and found the relaxed group showed significantly reduced hyperactive behavior over the control group.

Simpson and Nelson (1974) reported a preliminary study on breathing control and attention training for hyperactive children. The three experimental children were placed in a cubicle in which they received feedback concerning their breathing rate and the amount of discrepancy from a desired rate. The experimental children were also given attention training, while the control group worked only on tasks in the cubicles. The experimental group showed less breathing irregularity, better performance on tasks, and better attending behavior.

Martin and Hershey (1976) studied the effectiveness of biofeedback techniques in reducing the hyperactive behavior of five hyperactive and four nonhyperactive elementary children. After training sessions, the children learned to raise their finger temperatures and increase their attending behavior.

Relaxation training and biofeedback were used by Rivera and Omizo (1980) with 36 hyperactive male children in a study measuring attention to task and impulsivity. They found significant differences between the control and experimental group, with the treatment proving beneficial for improving attention and decreasing impulsivity. Similar results were noted by Dunn and Howell (1982) in a study of 10 hyperactive males. By examining pre- and posttesting scores, one can see that relaxation training increased accuracy and attending behavior, and decreased body movements while engaged in a quiet activity.

In a recent study Matthews (1982d) found positive significant differences in attendance, attrition, and disruptive behaviors between an experimental group who received relaxation training, and a comparable control group who did not receive training. The 62 preadolescents attended an eight-week volunteer summer program designed to teach beginning French.

Relaxation training is effective with hyperactive children who are normally treated by stimulant drug therapy (Braud, 1978). The advantage of relaxation training is that it works, is inexpensive, is ever-present, and takes a minimum amount of time to administer. Stimulant drugs are effective in decreasing over-activity and increasing attention span, but are less effective in the decrease of irritable, aggressive, explosive, or emotional behaviors that tend to remain after the symptoms of hyperactivity are no longer evident (Braud, 1978; and Denhoff, David, and Hawkins, 1971).

Orne (1966) points out that school can be conceived as an agent of stress for which the child reacts with hyperactivity, and lack of attention. The stimulus, school, is defined as a stressor, not by its objective qualities, but rather by its effect on the individual. Relaxation training can provide the individual with the internal control needed to deal with the stimulus. Thus, the child will tend to be able to tolerate similar stimuli of somewhat greater intensity in the future. Orne concluded by emphasizing that in order to succeed, individuals must have control over their behavior.

Initial research on relaxation training demonstrates that the technique can help in the reduction or elimination of some of the common problems faced by children under stress in schools. If its effectiveness can be maintained and additionally built, then its continued use in the classroom is not only possible but highly probable.

Self-Concept

Relaxation training is important in the improvement of self-concept. Since self-concept is a global construct and encompasses the child's interpretation of that child's abilities or characteristics, research often deals with subaspects and not the totality of the construct. In reviewing the literature one finds that empirical data are limited with the exception of several subaspects. However,

findings from the studies lead to some important and interesting revelations.

Using relaxation and biofeedback training, Omizo (1980b) found that the factors: aspiration, anxiety, and identification, changed significantly in the experimental group when compared with the control group. In another study with 56 hyperactive adolescent boys Omizo (1980a) found that relaxation training improved the level of aspiration and internal locus of control.

Walton (1977) found that biofeedback training among preadolescent, adolescent, and college-age students had significant effects on self-concept, internalized locus of control, abnormal behavioral problems, and reading achievement. In these studies, students were involved in electromyographic biofeedback coupled with formal relaxation training which was a modification of autogenic training procedures. Students in a college sample were chosen at random from individuals registered in the special education introductory course who were found to have grade point averages below the 2.5 level and who indicated they were experiencing severe anxiety. As a result of training, moderate positive changes in self-image along with significant growth in grade point average as measured by final examination scores in their academic courses were found in the experimental group.

Anxiety, another factor in self-concept, is examined in a number of studies. Training in relaxation procedures teaches the child to reduce test anxious behavior and thus improve the cognitive process. A rippling effect is the improvement of school grades which in time improves the self-image one has of the ability to achieve.

As far back as 1975, Synder was able to show that relaxation training is a powerful technique for reducing test anxiety, for changing the unpleasant attitude associated with test-taking, for increasing facilitating responsiveness to testing pressures, for positively changing perceptions of ability and

of self when taking tests, and for reducing anxiety in relation to other specific situations or objects. In more recent years studies by Deffenbacher and Snyder (1976), Houssian and Lawrence (1978), and Reed and Saslow (1979) support the earlier findings.

Although it is difficult for a researcher to measure the total self-concept, the literature supports the claim for relaxation techniques assisting the child with self development. The rippling effects of the treatment are many because as negative behaviors decrease and interaction with peers and adults increases, self-esteem and self-confidence build. Since there is a high correlation between self-concept and productivity, it appears that one can make a good argument for including relaxation training in the curriculum.

Achievement

Eastern cultures of the world claim great success in achievement when individuals practice daily with methods of relaxation which produce the alpha brain wave state. For instance, Georgi Zozanov (1969), a Bulgarian at the University of Sofia, found that by teaching the brain to relax from all stress, the mind could learn at a rate from 5 to 50 times faster and far more efficiently. The method now is known as Suggestopedia, and has proven that hundreds of people effortlessly learned a foreign language, the vocabulary and grammar of which were equivalent to a two- to three-year college course, in as little as sixty days. Follow-up studies revealed, also, that as late as a year afterwards virtually none of the material had been forgotten.

In the United States where the primary emphasis in society is on analytical skills, overwhelming success is difficult to show except in increases in achievement due to test anxiety reduction and the attention span increase as a result of muscle relaxation in the hyperactive child. Traditionally, beta brain waves were associated with cognitive skills. In recent literature, however, the alpha state is connected with long-term memory and creativity. According to Danskin

and Walters (1973), individuals who produce the greatest amount of alpha rhythms while speaking with their eyes open show the greatest memory retrieval. They further say that a state of reverie, approached through relaxation training, is linked with creativity.

Examples of memory retrieval are reported in the book, Super-Learning, by Ostrander and Schroeder (1979). With relaxation techniques, students at Iowa State University learned a whole semester of Spanish in 2 weeks and had fun so doing. They also reported that students in Washington, D.C., learned Latin in a fraction of the usual time and that students in California learned a Slavic language 3 times faster.

Other research on achievement includes the following.

Florence Schale (1970) found that students at Northwestern University when taught to relax to the alpha state, learned to read more rapidly. From 1 to 5 percent of her students developed the ability to read at rates of over 20,000 words per minute.

Harlem (1975) used the technique with elementary grade students in the regular classroom. He received positive results using autogenic training with black second graders. Relaxation trained students demonstrated superior performance in the Matching Familiar Figures Test, forward and backward digit span tasks, a paired associate task, and problem approach exercises. Trained students responded with increased flexibility to task demands as evidenced by more productive task approaches than control group students. The treatment was effective with both high and low achieving male and female pupils. Treatment gains were maintained over time.

According to Schultz and Walton (1979), at the Child's Service Demonstration Center, located in Provo, Utah, an extensive project was carried out during 1974 and 1975 which evaluated remediation programs for children with learning and behavior problems. These children, ranging from seventh to twelfth grades, were involved in remediation which included biofeedback training. At the

conclusion of the project, it was found that there was a significant positive change in mathematics ability and a significant decrease in underlying anxiety. It was also found that the reading achievement scores and positive study habits of the students involved in biofeedback training showed a marked gain.

Parsky (1975) investigated the effects of four different reading treatments on reading disabled children. Electromyographic feedback training was used to suppress subvocalization, when combined with individualized reading instruction. A total of 24 sixth-grade students from 2 elementary schools were involved in the project. At the conclusion of an eight-week training period, the students involved showed significant reduction of subvocalization in silent reading, whereas the control group showed no reduction in subvocalization. Significant gains in vocabulary were also found in the experimental group.

Two studies are reported with increases in achievement on the Wide Range Achievement Test as a result of relaxation training. A pilot study using four boys diagnosed as learning disabled by criteria of the State of Texas was done by Carter and Russell (1978a). Training sessions were conducted for 10 weeks, 1 time per week, 1 hour per session with 10 minutes of electromyographic feedback. Cognitive functioning and academic gains were assessed by pre- and posttreatment administration of the Wide Range Achievement Test. During the 10-week period (.19 of a year), the average gain of the four boys on the test was .65 of a year for reading, .67 of a year for spelling, and .52 of a year for arithmetic. Using electroencephalographic procedure, Patmon and Murphy (1978) report improved reading achievement on the Wide Range Achievement Test in a study of hyperactive adolescent learning disabled students.

In a recent study, Matthews (1982c) found slight gains in achievement scores of rural preadolescents who studied a foreign language but the gains were not statistically significant. However, the gains were made with less instructional time since the first 15 minutes of the day were used for relaxation procedures.

As one can easily see, the relationship between relaxation training and learning in the United States is an area needing much further research. There appears to be a great deal about the functioning of the brain and achievement in regard to the alpha state of which educators are presently unaware. After a careful examination of the literature, one can see no detrimental cognitive affect of relaxation as part of any school service; the trends are positive for inclusion of relaxation training in the school curriculum.

Is Relaxation Training for the Regular Classroom in Middle School?

Since the literature suggests positive results from relaxation training with exceptional children and with regular classroom students in highly controlled experiments, the author designed a research study to examine multiple outcomes simultaneously in the regular classroom with the regular classroom teacher. The research, known as Project Relaxation, measured cognitive (achievement) and affective (discipline, attendance, tardiness, and self-concept) changes with a program of relaxation training.

Following are the descriptions of the sample, procedures, and results from the studies of various outcome areas which were examined.

The Sample

The population was seventh grade students in 10 public and private middle schools in a four-county area in the midlands of South Carolina. The schools ranged from urban to rural with the socioeconomic levels of the parents from low to middle class.

The sample consisted of 532 students (260 girls and 272 boys) of which 273 were black and 259 white. Researchers selected students by sampling two intact classes of seventh graders from each school prior to the beginning of school. The principals arranged that the two classes within each school would have similar class schedules. At the time of selection, after schedules were constructed but prior to the opening of school, researchers combined the classes and formed

two new classes randomly from the combination. Class sizes depended upon the original two classes and ranged from 20 to 35 students.

One of the two classes was the experimental, or treatment group; the other was the untreated control group. No students or teachers were aware of the pairing of classes since the information was known only to the principal and counselor in the school. The principal randomly assigned teachers to the two groups. The experimental group knew only that they would participate in a stress management program as part of the regular curriculum. Parents signed consent forms for their children to participate in the program.

The sampling plan achieved a large sample, blind to the existence and purpose of the study, assigned to directly comparable pairs of classes.

Procedure

The students in the experimental group participated in relaxation training exercises for approximately 15 minutes at the beginning of each school day during a nine-month school year. The teachers played a series of audio-taped relaxation exercises, developed especially for middle school students, including such techniques as the quieting reflex, autogenics, and visual imagery.

Children recorded their wrist temperatures immediately before and after the relaxation exercises by using a wrist temperature indicator, a biofeedback instrument developed by Bio-Temp, Incorporated. The wrist indicator, worn like a wrist watch, utilized liquid crystal technology and was very sensitive to skin temperature changes. Wrist temperature increases as individuals become more relaxed. Therefore, pre- and postreadings of skin temperature provided a daily measure of the relaxation state and cumulative averages over time to determine the value of practice.

Throughout the school year, researchers also collected data on discipline referrals, absences and tardies of students. At the end of the study, the

children completed the Comprehensive Tests of Basic Skills (CTBS) and the Self Observation Scales (SOS). The instruments are national-normed instruments for measuring achievement (CTBS) and self-concept (SOS).

Effectiveness of the Relaxation Program: Results of the Wrist Temperature Data

Table 1 presents the mean wrist temperature increase from daily prereading to postreading (in degrees Fahrenheit) for each of the relaxation exercises over the duration of the project. The five exercises with the lowest means (QR reinforcement, Matthews 1, Matthews 2, Holland A, and Holland B) were introductory exercises with declining effectiveness over time and were discontinued midway through the project following preliminary results. The remaining twenty-three audio-taped exercises were associated with average wrist temperature increases ranging from 2.24 to 2.82 degrees. All of the exercises appear effective in eliciting the relaxation response. The remaining twenty-three exercises are ordered according to their effectiveness and the data are presented graphically in Figure 1.

Differences were anticipated among the eleven classes in their ability to relax, and thus in their mean wrist temperature increases. There may be a variety of reasons for inter-class differences, such as classroom environment, teacher enthusiasm, peer influence, and length of available time. The means and standard deviations of the wrist temperature increases for each of the eleven classes are presented in Table 2. There are clear differences across class, with the means ranging from 1.84 to 3.17. The data are presented graphically in Figure 2.

With the classroom used as the unit of analysis ($n=11$), a dependent t-test was conducted between the prereading and postreading to determine whether the increase in wrist temperatures was significant. Table 3 shows the t-value of 18.64 was significant at the pre-established .05 level of significance. Actually

Table 1

Mean Change in Wrist Temperatures for Each Tape

Tape Number *	Tape Name	Mean	St. Dev.
1	Charlesworth	2.62	1.72
2	Holland B	1.70	2.04
3	Holland C	2.24	1.83
4	Holland D	2.52	1.76
5	Holland E	2.57	1.66
6	Matthews 1	1.87	1.91
7	Lupin I-3	2.52	1.67
8	Holland A	1.75	1.98
9	GSR ²	2.53	1.75
10	Matthews 3	2.63	1.65
11	Matthews 4	2.63	1.68
12	Matthews 5	2.38	1.68
13	Matthews 2	1.69	1.84
14	Matthews 6	2.44	1.64
15	Matthews 7	2.56	1.67
16	Lupin I-4	2.75	1.60
17	Q R Reinforcement	2.17	1.96
18	Matthews 8	2.63	1.64
19	Matthews 9	2.52	1.76
20	Matthews 10	2.57	1.70
21	Lupin I-5	2.69	1.72
22	Lupin I-6	2.77	1.66
23	Lupin II-1	2.70	1.69
24	Lupin II-2	2.73	1.70
25	Lupin II-3	2.66	1.70
26	Lupin II-4	2.82	1.78
27	Lupin II-5	2.74	1.72
28	Lupin II-6	2.75	1.70

* Note: Tape numbers were assigned chronologically as tapes were introduced into the program and data were collected.

Figure 1

Graph of the Relative Effectiveness of the Relaxation Exercises

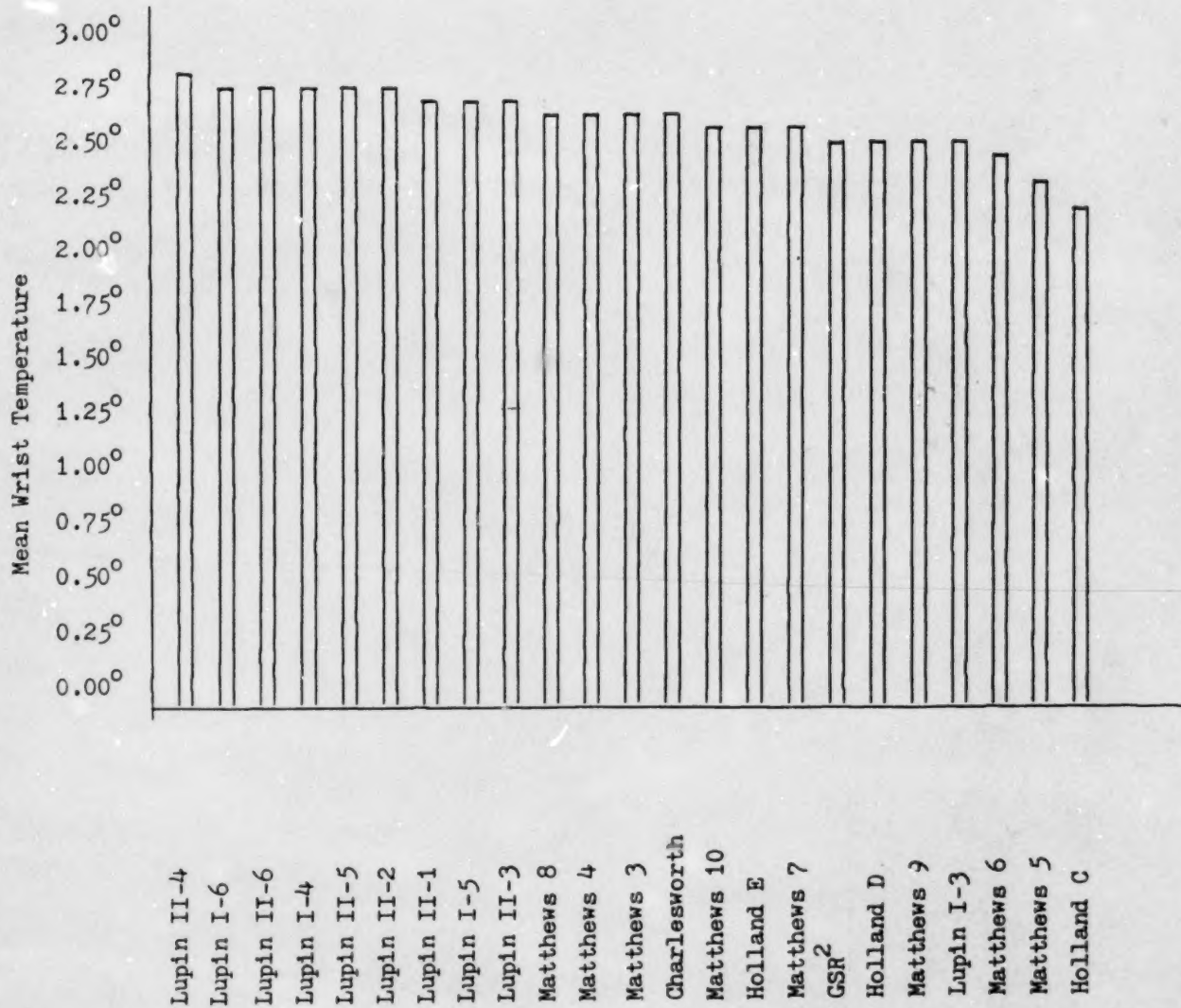


Table 2

Average Increase in Wrist Temperature Between Pretesting and
Posttesting in Each Class

Class Code	Mean	St. Dev.
10	3.17	1.68
11	3.02	1.73
12	2.09	1.58
13	2.44	2.20
14	3.06	1.50
15	1.84	1.72
16	3.03	1.50
17	2.12	1.84
18	2.90	1.61
19	2.31	1.65
20	2.73	1.62

Figure 2

Graph of the Average Increase in Wrist Temperatures Between
Pretesting and Posttesting in Each Class

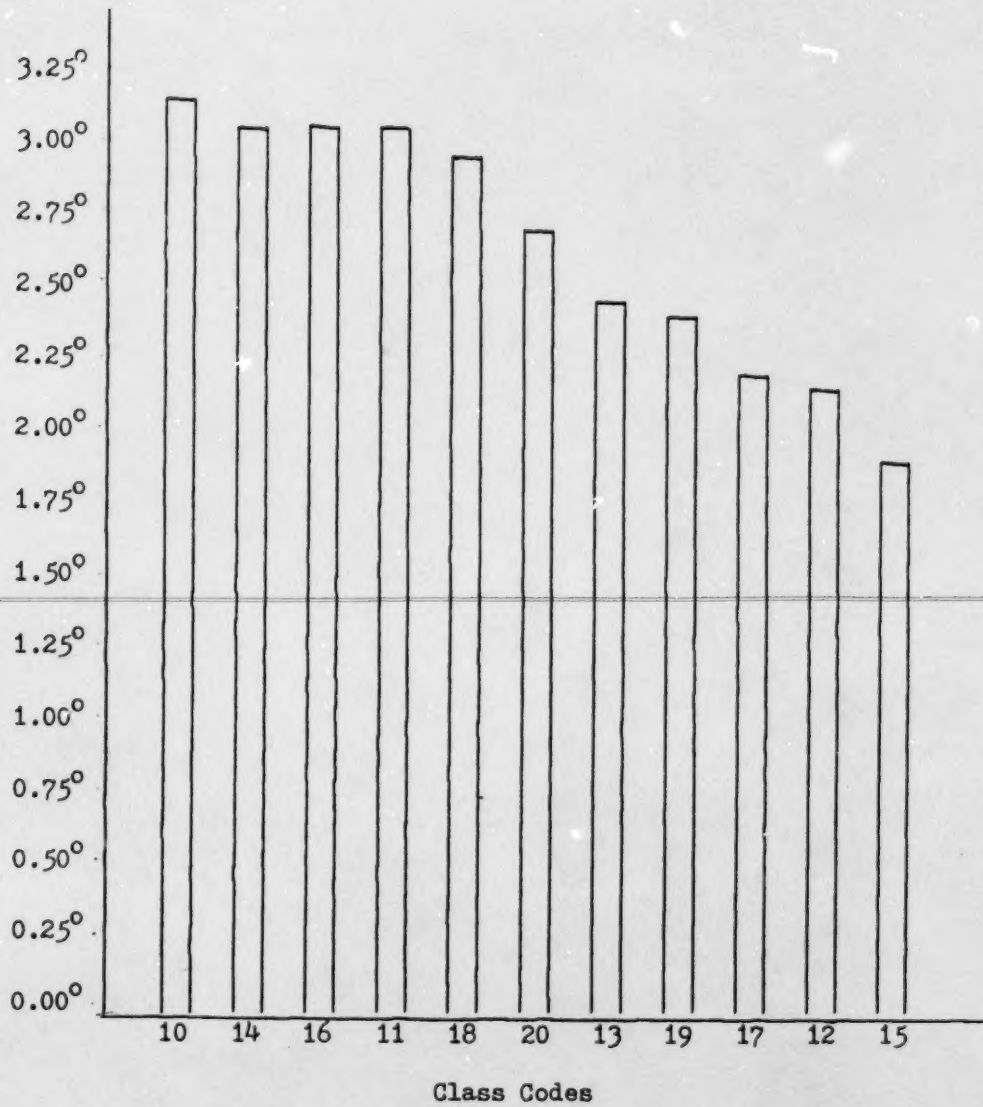


Table 3

Means and T-test of Wrist Temperature Increases

n=11

Time	Mean	St. Dev.	t-value
Prereading	87.95	1.79	18.64 *
Postreading	90.55	1.92	
Difference	2.61	0.47	

* significant at the .0001 level

the exact probability of the t-value is less than .0001. This finding indicates that the relaxation exercises were effective in raising wrist temperatures, the measure of relaxation response in the study.

The effects of time and practice on relaxation skills were examined by studying the changes in wrist temperatures as the project progressed. The wrist temperature readings were compiled by taking the mean across all experimental students and across the five days of each week in the twenty-nine weeks of the project. These means are reported in Table 4 for the pre-reading, the post-reading, and the difference (increase from the pre-reading to the post-reading). The table shows an increase (positive difference) for each of the twenty-nine weeks from September 20 to April 29.

The weekly mean wrist temperature differences (previously reported in Table 4) are graphically displayed as a time-series in Figure 3. If practice is an important factor in learning to relax, the change in wrist temperatures should increase as the project proceeds. A Pearson product moment coefficient of correlation was computed between the week and the mean increase in wrist temperatures. A correlation of 0.76 was found, which is significant at the 0.05 level. This shows that the mean change increases as the weeks progress, indicating that practice may be an important factor in learning relaxation skills. The decreases which are most apparent are at weeks 7 (Halloween), 13 (Christmas), and 23 (Spring Break) indicating the heightened tension which surrounds such holidays and perhaps the regression caused by having a break in the daily relaxation routine.

Results of the Study of Attendance and Tardiness

The number of absences and tardies for each student were collected in both the experimental and control groups. Attendance and tardiness means are reported in Tables 5 and 6, respectively. The means are shown for the experimental and control groups separately within each of the eleven pairs of classes.

Table 4

Mean Wrist Temperatures by Weeks

Week	Dates	Pre-Reading	Post-Reading	Difference
1	Sept. 20 - Sept. 24	89.36	91.18	1.82
2	Sept. 27 - Oct. 1	88.56	90.81	2.27
3	Oct. 4 - Oct. 8	89.88	91.96	2.07
4	Oct. 11 - Oct. 15	89.23	91.56	2.33
5	Oct. 18 - Oct. 22	88.69	91.16	2.48
6	Oct. 25 - Oct. 29	87.93	90.54	2.62
7	Nov. 1 - Nov. 5	89.44	91.81	2.37
8	Nov. 8 - Nov. 12	88.09	90.53	2.44
9	Nov. 15 - Nov. 19	87.59	90.28	2.69
10	Nov. 22 - Nov. 26	89.08	91.87	2.79
11	Nov. 29 - Dec. 3	89.77	92.24	2.47
12	Dec. 6 - Dec. 10	88.09	90.52	2.45
13	Jan. 3 - Jan. 7	87.81	90.17	2.38
14	Jan. 10 - Jan. 14	87.45	89.93	2.47
15	Jan. 17 - Jan. 21	86.19	88.78	2.59
16	Jan. 24 - Jan. 28	87.76	90.51	2.75
17	Jan. 31 - Feb. 4	88.21	90.93	2.72
18	Feb. 7 - Feb. 11	87.44	90.13	2.69
19	Feb. 14 - Feb. 18	87.69	90.47	2.78
20	Feb. 21 - Feb. 25	88.08	90.83	2.75
21	Feb. 28 - Mar. 4	88.04	90.75	2.71
22	Mar. 7 - Mar. 11	88.48	91.32	2.84
23	Mar. 14 - Mar. 18	88.17	90.75	2.58
24	Mar. 21 - Mar. 25	87.44	90.17	2.74
25	Mar. 28 - Apr. 1	86.99	89.74	2.74
26	Apr. 4 - Apr. 8	90.05	93.01	2.96
27	Apr. 11 - Apr. 15	87.82	90.54	2.71
28	Apr. 18 - Apr. 22	87.22	89.92	2.71
29	Apr. 25 - Apr. 29	87.61	90.38	2.77

Figure 3
Time-Series Graph of Mean Wrist Temperature Change by Weeks

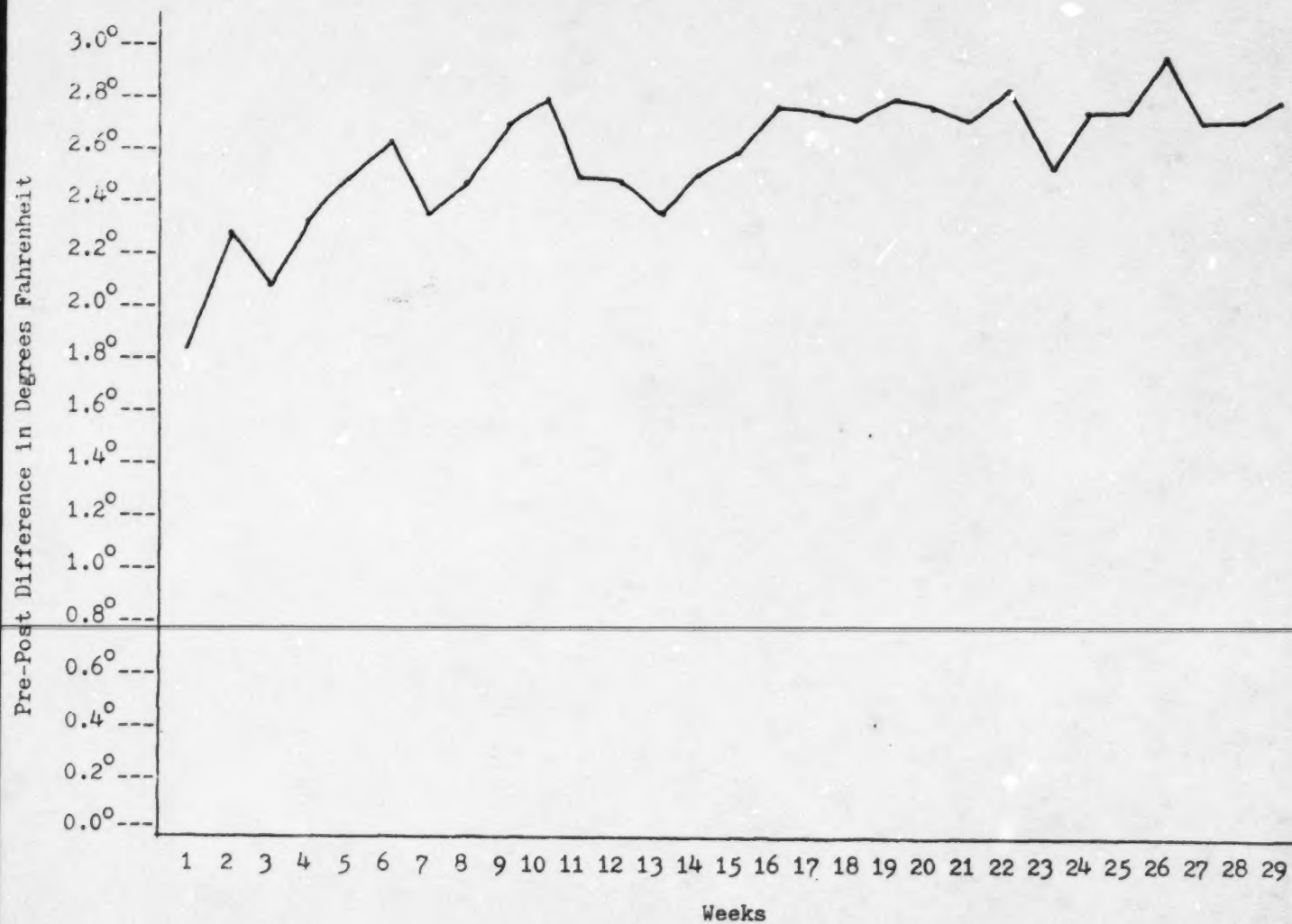


Table 5

Average Number of Absences Per Student in Each School

School	Type	Mean	St. Dev.
10	Experimental	8.38	9.77
	Control	5.09	4.42
11	Experimental	4.86	4.48
	Control	8.38	5.87
12	Experimental	2.24	1.90
	Control	2.88	3.25
13	Experimental	8.11	10.80
	Control	4.16	5.08
14	Experimental	7.59	7.47
	Control	3.93	3.52
15	Experimental	4.88	3.91
	Control	5.52	4.19
16	Experimental	1.69	2.70
	Control	2.72	3.14
17	Experimental	7.43	8.17
	Control	4.04	4.13
18	Experimental	5.15	5.36
	Control	4.92	5.14
19	Experimental	5.70	7.06
	Control	5.53	6.60
20	Experimental	3.43	2.62
	Control	4.04	2.96

Table 6

Average Number of Tardies Per Student in Each School

School	Type	Mean	St. Dev.
10	Experimental	2.96	3.33
	Control	2.27	2.80
11	Experimental	5.18	5.54
	Control	0.76	0.77
12	Experimental	1.08	1.32
	Control	0.75	0.85
13	Experimental	4.94	5.07
	Control	3.50	5.64
14	Experimental	6.67	8.97
	Control	8.88	11.34
15	Experimental	0.52	0.96
	Control	1.56	2.10
16	Experimental	0.25	0.58
	Control	5.56	13.13
17	Experimental	1.30	1.99
	Control	2.21	3.27
18	Experimental	6.64	8.61
	Control	6.04	6.63
19	Experimental	0.64	1.67
	Control	1.17	1.66
20	Experimental	0.61	1.40
	Control	0.54	1.40

the means indicate the average number of absences or tardies per student over the entire school year. Evident in the data, but not of major concern, are the differences among the schools. The highest absentee rate is 9.38 average absences per student, while the lowest is 1.69. Both of these classes were in the experimental groups. Obviously, there are large school differences in absenteeism due to a variety of outside and school-related influences. The same is true of tardiness which ranges from 0.25 average tardies per student to 8.88. Besides other influences, tardies may depend upon the reporting system employed within each school.

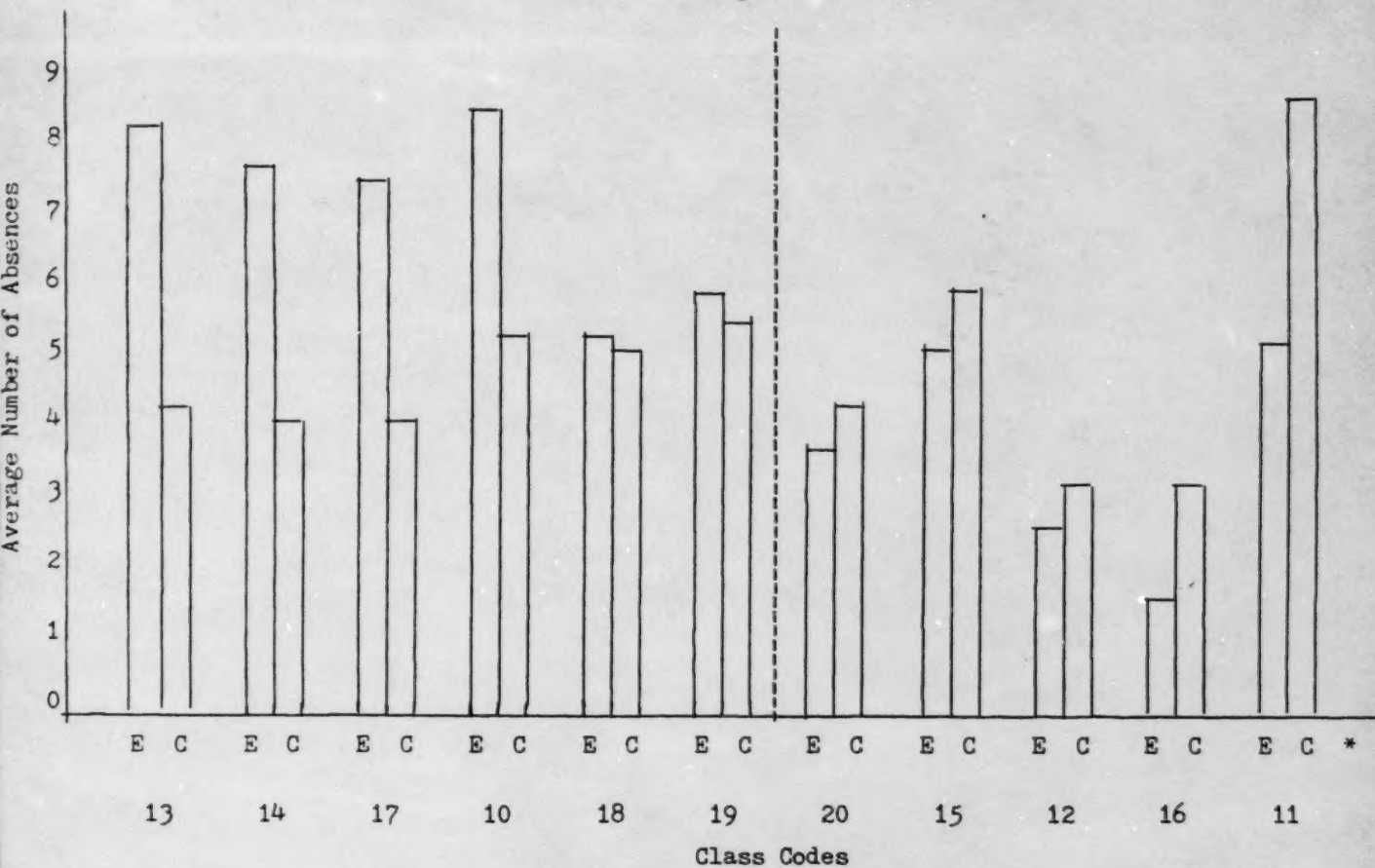
Figures 4 and 5, respectively, present the absentee and tardy data graphically. Each school is shown with the experimental group on the left and the control group on the right. Each figure is divided by a dotted line. Schools to the left of this line had higher absentee or tardy rates in the experimental group than in the control group. Schools to the right of the dotted line had higher absentee or tardy rates in the control group than in the experimental group. The schools are split approximately evenly. Thus, while individual schools may show differences favoring either the experimental or control group, these differences average out when all the classes are included.

With the class as the unit of analysis, the total absentee and tardy rates were computed for the experimental and control groups. The means and standard deviations are presented in Tables 7 and 8 for absenteeism and tardiness, respectively. The experimental group has a slightly higher absentee rate than the control group. This difference is not significant, however, as indicated by the very low *t*-value. In tardiness, the control group average a slightly higher rate; however, this difference also proved non-significant.

There apparently are no differences between the experimental and control groups in either absences or tardies. Perhaps more time would be required to affect such an overt behavioral measure. More likely, absenteeism and tardiness

Figure 4

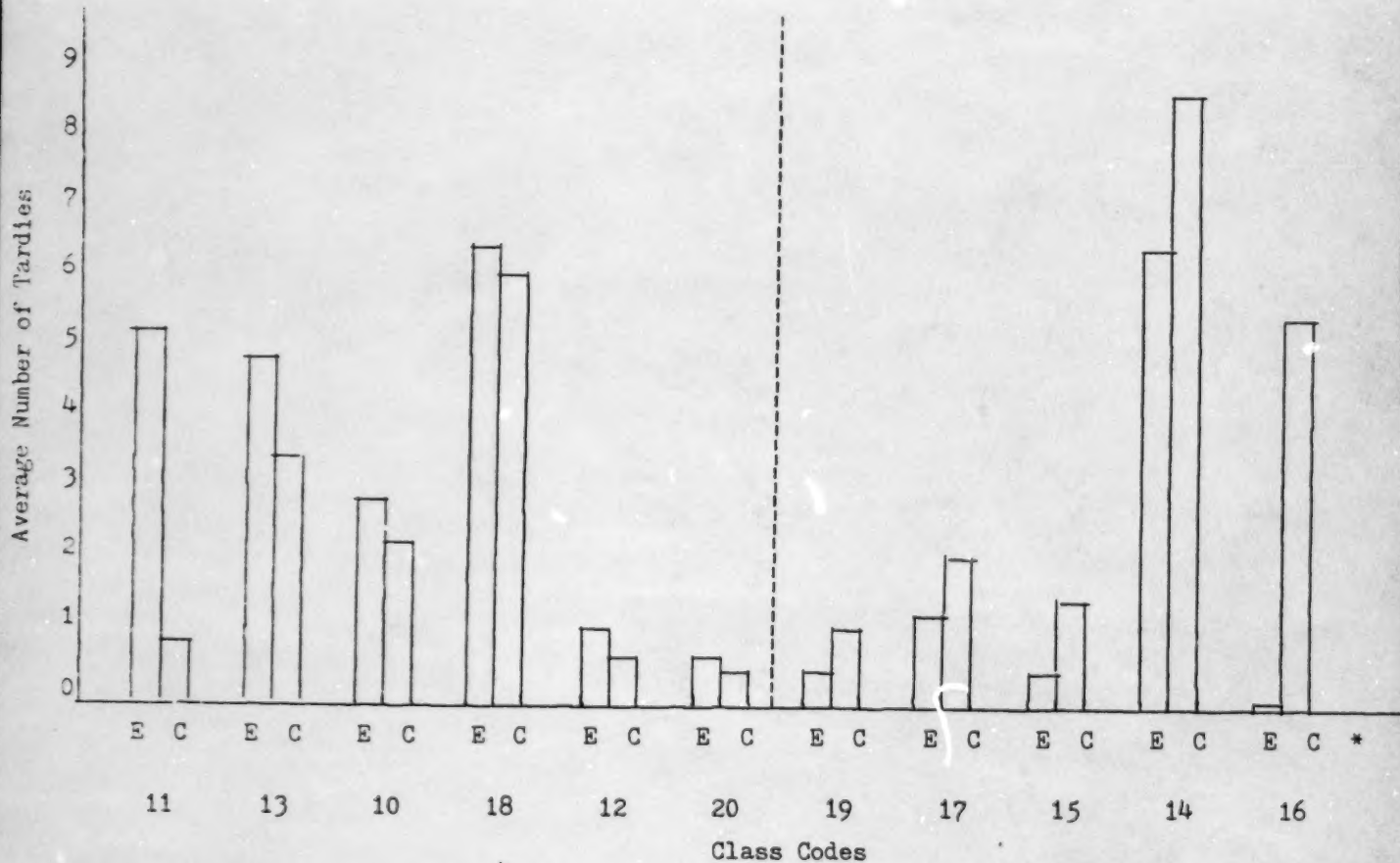
Graph Comparing Average Number of Absences Between Experimental and Control Groups in Each Class



* E=Experimental C=Control

Figure 5

Graph Comparing Average Number of Tardies Between Experimental and Control Groups in Each Class



* E=Experimental C=Control

Table 7

Means and T-test of Absenteeism .

n=11			
Group	Mean	St. Dev.	t-value
Experimental	5.41	2.31	0.89
Control	4.65	1.55	

Table 8

Means and T-test of Tardiness

n=11			
Group	Mean	St. Dev.	t-value
Experimental	2.80	2.58	-0.20
Control	3.02	2.71	

are variables which are controlled to a large extent by forces outside the students' influence. Parental attitude and family obligations including family illnesses and death or family vacations create situations beyond the students' control. Also, the differences between excused and unexcused absences and tardies were not taken into account, so such problems as late school buses were taken as tardies although students were not responsible. Illness, the method each school uses to report the tardies and absences, and a host of other extraneous variables may affect the results.

Results of the Study of Self-Concept

Testing, including the administration of the Self Observation Scales (SOS) to measure self-concept, occurred at the end of the relaxation training program. Teachers administered the SOS to the students, reading each statement aloud. The SOS is a nationally-normed, multi-dimensional instrument for measuring the way students perceive themselves (self-concept). The junior high level of the SOS measures seven dimensions of self-concept. High scores on each scale are most characteristic of the scale name. The scales are self-acceptance, self-security, social confidence, self-assertion, peer affiliation, teacher affiliation, and school affiliation.

Table 9 reports the means and standard deviations of the experimental and control groups on each of the seven subscales. The experimental group had a higher mean on all subscales except teacher affiliation. Whether significant or not, all results were in the expected direction, that is, the experimental group scored higher on all self-concept scales except affiliation with the teacher. Researchers used a split-plot design to test each subscale for significant differences. The tests were two-way analyses of variance with schools as the random factor and experimental or control group as the fixed factor. As anticipated, schools differed on all seven subscales; however, this information is of little or no interest. Rather, researchers examined the main effect of

Table 9

Mean Scores of Experimental and Control Groups on
Subscales of the Self Observation Scales

Subscale	Experimental		Control	
	Mean	St. Dev.	Mean	St. Dev.
Self-Acceptance	54.20	5.86	52.96	6.98
Self-Security	49.41	8.65	48.63	8.76
Social Confidence	48.06	10.16	46.88	9.78
Self-Assertion	53.55	9.70	51.40	9.63
Peer Affiliation	51.96	8.00	50.52	8.55
Teacher Affiliation	51.03	9.77	51.45	9.33
School Affiliation	48.94	11.33	48.93	10.30

Table 10

F Tests Between Experimental and Control Groups on
Subscales of the Self Observation Scales

Subscale	Sum of Squares	F Value	Probability
Self-Acceptance	195.93	4.86	0.0279 *
Self-Security	76.71	1.03	0.3097
Social Confidence	176.75	2.28	0.1314
Self-Assertion	590.94	6.70	0.0099 *
Peer Affiliation	263.23	3.91	0.0486 *
Teacher Affiliation	22.93	0.27	0.6011
School Affiliation	0.01	0.00	0.9931

* significant at the .05 level

experimental/control differences and the interaction between the two main effects. There were no significant interactions. Table 10 reports the sums of squares, F values, and probabilities associated with the experimental/control main effect only. Three of the seven tests are significant at the .05 level; self-acceptance; self-assertion; and peer affiliation.

Since the randomized groups could be considered initially equivalent, researchers attribute posttest differences to the experimental intervention. Apparently, the relaxation training program has a positive effect on self-acceptance, self-assertion, and peer affiliation. Self-security and social confidence, while not significant, also resulted in positive differences.

Results of the Study of Discipline Infractions

Table 11 reports the frequencies of discipline infractions for the control and experimental groups and the results of a z-test of significance between the two proportions. The z-value of 3.574 is significant at the .05 level of significance, indicating that the number of discipline problems differ between the control group and the experimental group. The data support the hypothesis that there are more reported discipline problems in the control group than in the experimental group. These data are further separated into seventeen specific discipline violations in order to determine exactly which types of unacceptable behavior have been affected by the relaxation training. Three of these infractions had no incidents in either the experimental or control groups. The data for the other fourteen violations are reported in Table 12. Z-tests were conducted for nine of these fourteen areas and are reported in Table 12. Of the nine behavior types tested, only the discipline problems of "fighting" and "cutting class" have significant z-values at the .006 level of significance. An alpha level of .006 is used in this case to produce an approximate family-wise error rate of .05 for the nine tests. The control group had a higher number of instances of fighting than did the experimental group. This result supports

TABLE 11

Frequency Table and Z-Test of Discipline Infractions
Between the Control and Experimental Groups

Infraction	Control n=265	Experimental n=266	Z-value
Total of discipline infractions reported to school office	264	188	3.574 *

* indicates a significant z-value at the .05 level of significance, with an exact probability less than .0003

TABLE 12

Frequency Table and Z-Tests of Discipline Infractions
by Category Between the Control and Experimental Groups

Infraction	Control n=265	Experimental n=266	Z-value
cutting class	14	3	2.678 **
leaving campus without permission	1	2	*
loitering in unauthorized areas	3	5	*
persistent disobedience	66	56	1.000
excessive noise/attention getting	35	31	0.493
persistently disturbing another student	26	19	1.044
disrespect/insubordination	43	32	0.058
threatening/intimidating staff	6	3	*
theft/cheating/gambling	0	1	*
fighting	30	10	3.165 **
vandalism	1	0	*
physical abuse of students/staff	20	17	0.494
habitually failing to do homework	9	3	1.786
habitually failing to do classwork	10	6	1.000

* Z-values were not computed where combined cell sizes were less than 10

** indicates a significant z-value at the .006 level of significance

the hypothesis that students with relaxation training will exhibit fewer instances of explosive types of behavior compared to students without training, since the "fighting" category is the most explosive of the discipline categories.

The results of the z-tests support the hypothesis that there are significantly fewer discipline problems among students who receive the relaxation training than among those who do not receive the training. Apparently, the relaxation program decreases the number of incidents of disruptive behavior, particularly cutting class and such explosive behavior as fighting. This finding indicates that students receiving relaxation training are less likely to exhibit types of behavior which are considered unacceptable. One possible explanation of this finding is that students receiving relaxation training remain relatively calm throughout the day.

Results of the Study of Cognitive Differences Between Experimental and Control Groups

The Comprehensive Tests of Basic Skills (CTBS) are administered to 7th graders by the South Carolina Department of Education in April of each year. The results of the CTBS for the students in the project are reported in Table 13. This table reports the mean scale score for the experimental group on the total battery and on the three subtests: reading, language, and math. Also reported is the difference between the mean for the experimental group and the mean for the control group. This difference represents actual scale score points where a positive number indicates a higher mean in the experimental group and a negative number indicates a higher mean in the control group.

Independent t-tests were conducted between the experimental and control groups on each of the three CTBS subtests and the total battery. Classes were used as the unit of analysis ($n=11$). The results are shown in Table 14. None of the four t-tests conducted were significant at the .05 level. The two groups do not differ on CTBS scores. In other words, simply participating in the

Table 13

Results of the Comprehensive Tests of Basic Skills *

School	Reading Scale Score	Reading Difference	Language Scale Score	Language Difference	Math Scale Score	Math Difference	Total Scale Score	Total Difference
1	670	-10	662	5	696	-3	676	-3
2	692	11	680	20	702	10	691	13
3	711	-9	686	-13	714	-1	704	-7
4	692	-5	666	-10	698	-2	685	-6
5	776	11	744	8	738	5	753	8
6	688	-3	674	-6	698	-5	686	-7
7	722	5	704	12	718	2	714	5
8	707	-5	688	-1	703	-5	699	-4
9	716	33	686	18	710	17	704	23
10	758	-2	734	-6	727	-4	740	-3
11	752	-16	728	-15	719	-3	733	-11

* "Scale Scores" represent the mean scale score for the experimental group. "Difference" is the number of scale score points difference between the experimental and control group means (control mean subtracted from the experimental mean).

Table 14
Independent t-tests Between Experimental and
Control Groups on CTBS Scale Scores

Subtest	Group	Mean	t-value	Probability
Reading	Experimental	721.2		
	Control	720.1	0.22	0.82
Language	Experimental	699.9		
	Control	698.8	0.24	0.81
Math	Experimental	712.6		
	Control	711.8	0.45	0.66
Total	Experimental	711.7		
	Control	710.4	0.35	0.73

relaxation exercises does not influence cognitive processes.

The CTBS scores were then compared to the wrist temperatures (relaxation indicators) in a series of scatterplots. Figure 6 plots the difference between pre-reading and post-reading wrist temperatures against the difference between total CTBS scores for the experimental group and total CTBS scores for the control group. This figure shows that students who respond weakly to the relaxation training generally perform slightly lower on total CTBS scale scores than their control group which had no training. Possibly, the relaxation training reduces anxiety and thus reduces motivation to succeed on the CTBS. Six schools had mean wrist temperature increases which were small (less than 2.75°F.) and in all six cases the experimental group scored below the control group. For those classes in which the relaxation difference was 2.75°F. or greater, however, the experimental group scored higher than the control group in four out of five pairs of classes. These classes exhibited a substantial increase in observed difference scores on the CTBS.

The data suggest the existence of a curvilinear relationship between physiological response to relaxation training and performance on the CTBS. The nature of this relationship masks the overall difference between the experimental and control groups (as noted in Table 14), but Figure 6 allows a clearer understanding of the relationship between relaxation response and performance.

Figures 7, 8, and 9 show the relationship between the experimental group's increase in wrist temperature and the difference between the experimental and control groups' performance on the CTBS reading subtests, language subtest, and math subtest, respectively. All three scatterplots indicate the existence of a "threshold" or minimum degree of relaxation necessary to produce changes in cognitive performance. At an approximate increase of 2.75°F. the data change. Classes, in which means are lower than 2.75° , are characterized in each case by experimental groups which perform lower than the control group on the CTBS. When

Figure 6

Scatter-Plot of CTBS Difference Between Experimental and Control
Groups with Difference from Pre-Reading to
Post-Reading Wrist Temperature

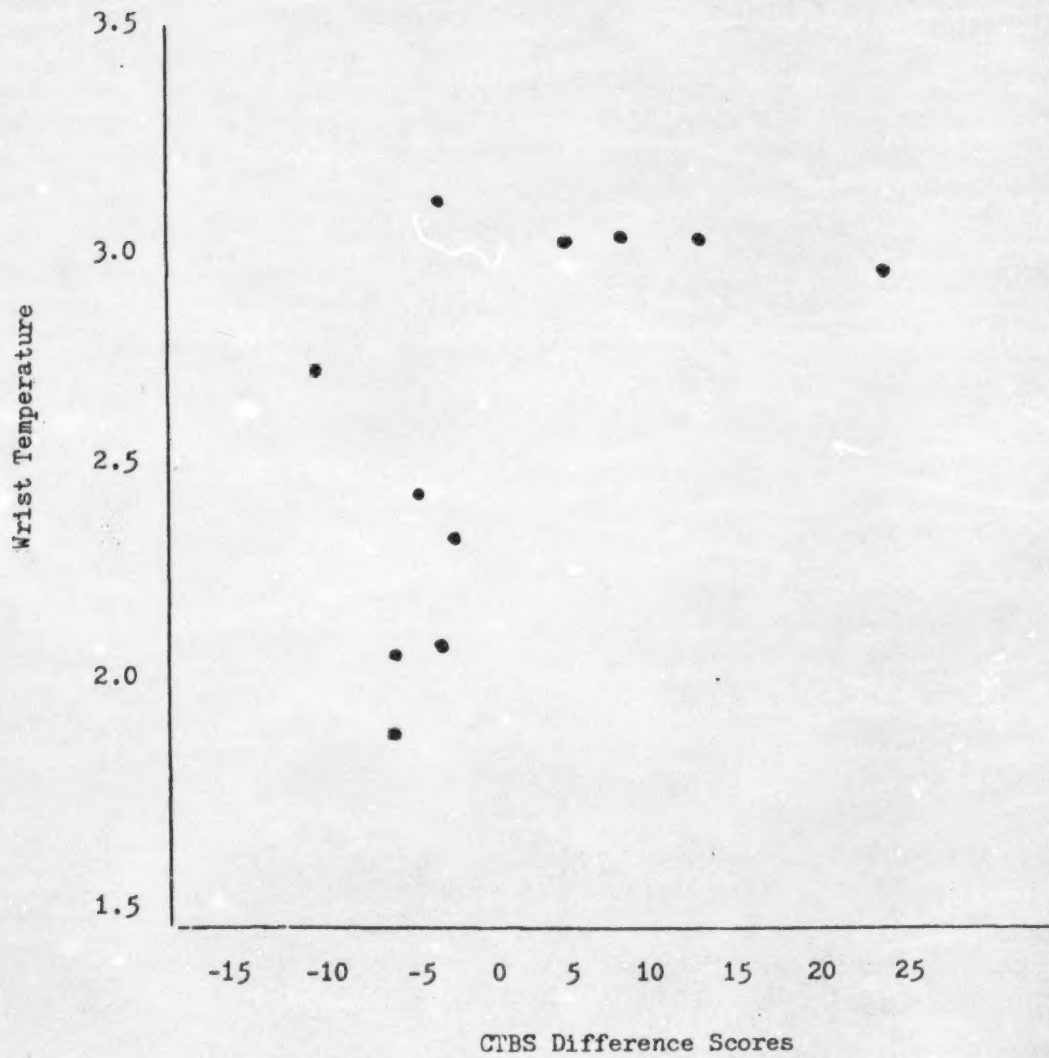


Figure 7

Scatter-Plot of CTBS (Reading Subtest) Difference Between
Experimental and Control Groups with Difference
from Pre-Reading to Post-Reading Wrist Temperatures

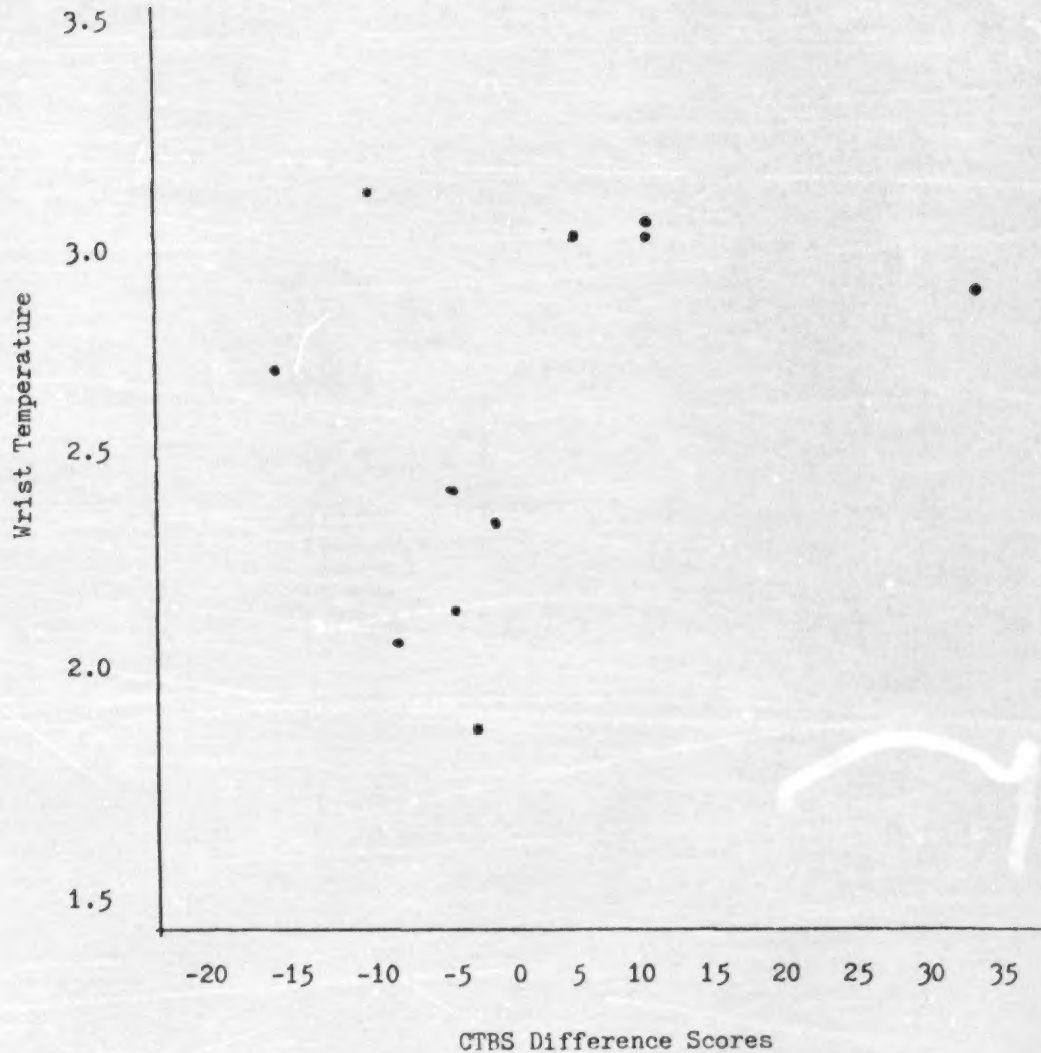


Figure 8

Scatter-Plot of CTBS (Language Subtest) Difference Between
Experimental and Control Groups with Difference
from Pre-Reading to Post-Reading Wrist Temperatures

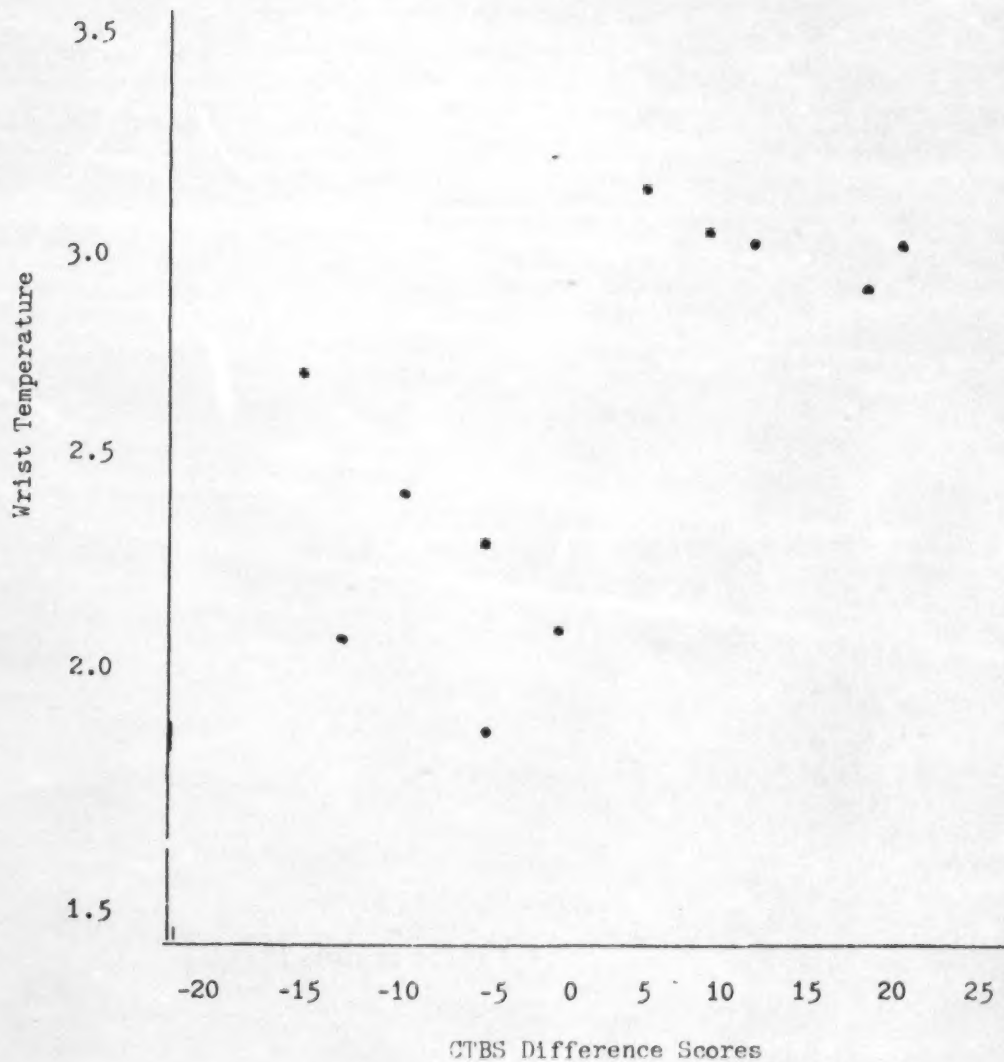
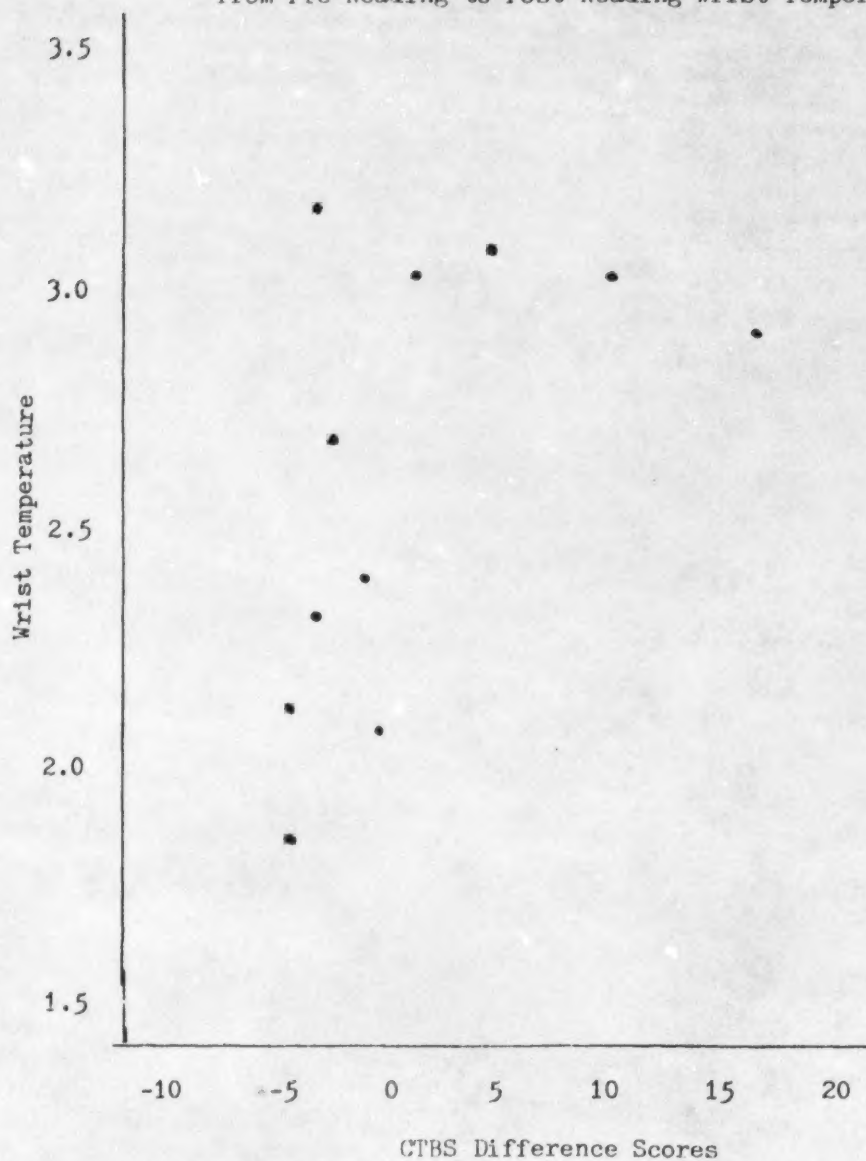


Figure 9

Scatter-Plot of CTBS (Math Subtest) Difference Between
Experimental and Control Groups with Difference
from Pre-Reading to Post-Reading Wrist Temperatures



mean temperature increases exceed 2.75° , the experimental group tends to outperform the control group. These results indicate that there is a threshold where relaxation training becomes effective. Participating in a relaxation program is apparently nonproductive if the skill is not learned well enough to produce large changes in physiological measures. When the skill is adequately learned, however, it is indicated that some cognitive gains can be achieved. This finding seems to suggest that if relaxation training is pursued until the student has mastered the skill of eliciting the relaxation response, there may be significant gains in learning. This hypothesis demands further examination.

Conclusions

Project Relaxation shows clearly that a long-term program of relaxation training can be implemented within the school setting. Also, such a program can have dramatic effects. Improvements in self-concept, discipline problems, and achievement are beneficial not just for an individual, but for the student body, the school, and the community.

Meanwhile, middle school students are at an "in-between" stage in their lives, no longer children and not yet adults, which combines with the hormonal changes in their bodies to create stress. In the face of heavy factors for stress upon children of today, the children must learn coping techniques not just for success, but for survival. Learning to relax at will is one method of learning to survive, because the relaxation response is incompatible with anxiety. In other words, as the child learns to cope, the personality grows and the character firms. The child learns to manage stress rather than to be managed by it.

It is in the school curriculum, therefore, that the best opportunity for structured and organized learning of stress management occurs. Research demonstrates the need for such a program. There is a rationale for teaching relaxation training first to teachers and then to students. Self-management skills and self-concept improves. Various abilities to attain achievement improve.

The implementation of the program is not expensive and depends upon the attitudes of school personnel. Working together, the school personnel gain knowledge of the necessary techniques. Inservice training, of course, is essential, as well as the availability of time and instructional materials. With these fundamentally simple yet disciplined components, the prediction for success becomes positive for the students in affective and cognitive behaviors. The school should prepare the child for the worlds of today and tomorrow by including relaxation training as the Fourth "R" in the school curriculum.

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APPENDIX A

Materials Appropriate for Relaxation Programs in Schools

Relaxation Exercises

1. Peace, Harmony, Awareness: A Relaxation Program for Children by
Mimi Lupin

Order from: Teaching Resources Price \$ 79.95
50 Pond Park Road
Hingham, Massachusetts

2. Q.R. for Young People (ages 10+) by Margaret Holland

Order from: Q.R. Institute-South Price \$ 49.50
8509 North 29th Street
Tampa, Florida 33604

3. Kiddie Q.R. (ages 5-10) by Liz Stroebe

Order from: Q.R. Institute Price \$ 49.50
119 Forest Drive
Wethersfield, Connecticut 06109

4. The Relaxation and Stress Management Program by Edward A. Charlesworth

Order from: Biobehavioral Publishers Price \$ 29.95
and Distributors, Inc.
P.O. Box 1102
Houston, Texas 77001

5. Relaxation Exercises for Young People (ages 10+) by Doris B. Matthews

Information from:
Doris B. Matthews
P.O. Box 1715
South Carolina State College
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Wrist Temperature Indicator

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